NATIONAL ACADEMY OF SCIENCES

FRANK ELMORE ROSS

1874—1960

A Biographical Memoir by

W.W. MORGAN

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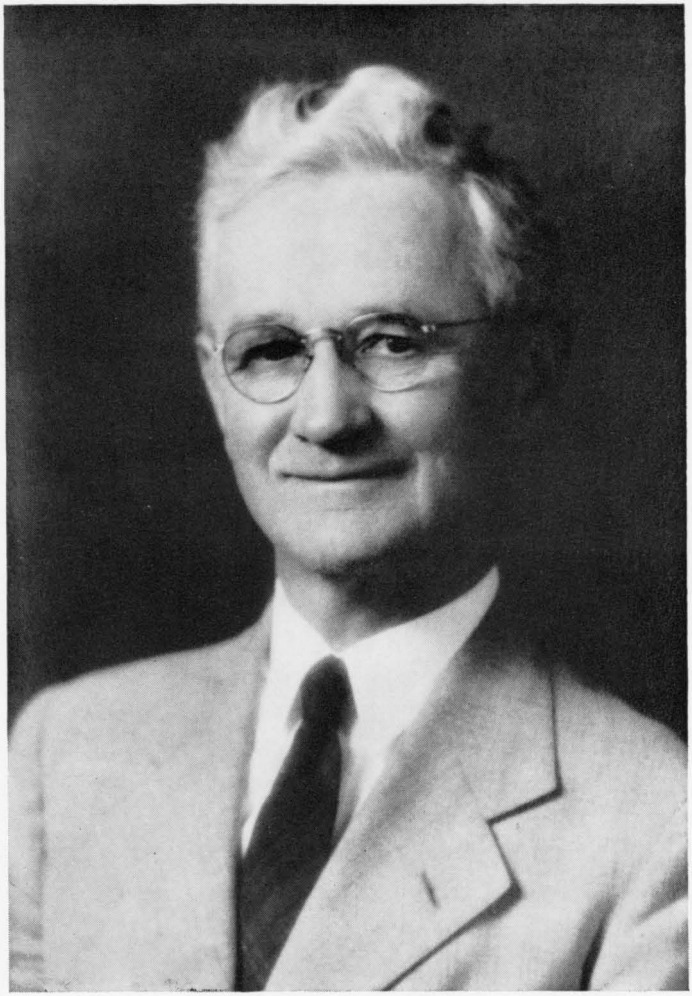

Frank C. Ross

FRANK ELMORE ROSS

April 2, 1874–September 21, 1960

BY W. W. MORGAN

THE CAREER of Frank Elmore Ross occupies a unique place in the history of twentieth-century astronomy. He was a scientist of a type more frequently encountered in earlier periods than in our own; calm, contemplative, he had the habit of staying with a problem that had roused his interest for extended periods of time—and of refusing to allow any external circumstance to weaken his work.

This characteristic of a continued, unhurried involvement in a problem was one of the reasons for success in his greatest undertakings: (1) the computation, design, and use of a wide-angle astronomical camera giving highly corrected star images over a field of 20° in diameter; (2) the delineation of the large-scale structural features of the northern Milky Way, by the use of the wide-angle camera that he himself had developed; and (3) the computation of correcting lenses for reflecting telescopes, which has made possible a major increase in the usable field of instruments like the Mt. Palomar 200-inch reflector.

In all of these activities we find a sensitive blending between theoretical thought and a high degree of experimental ability. But he had in addition the temperament and quality necessary to carry out long-range observational programs with other instruments. He carried through a major program of repeating the early photographs of Barnard with the Yerkes 10-inch Bruce

photographic telescope. An intercomparison of early- and late-epoch plates of the same fields resulted in the discovery of a large number of stars of rapid cross-motion on the sky; among these new discoveries were a number of stars of special interest. In addition, he discovered by intercomparison a considerable number of new variable stars.

He also distinguished himself in other fields. He founded and became the director of the Observatory of the International Geodetic Association at Gaithersburg, Maryland. Here he put into operation a photographic adaptation of the zenith tube for precise determination of latitude—and study of its variation. He also developed methods for photographing the planets; his photographs of Venus and Jupiter are of very high quality.

At the Nautical Almanac office he collaborated with Simon Newcomb in investigations on the gravitational effects of the planets on the moon; he also published papers on the irregularities in the moon's longitude.

Frank Elmore Ross was born in San Francisco on April 2, 1874. His father, Daniel Ross, was a building contractor who lost a fortune during the gold mine boom. His family moved to San Rafael around 1882, where he went to grammar school and worked part time in a printer's shop. He became interested in mathematics in high school. He received the B.S. degree at the University of California (Berkeley) in 1896. During the summers of his college career he worked on his uncle's ranch in northern California, where his salary for an entire summer was $40. He also was employed as a bill collector in San Francisco.

He received his Ph.D. degree at Berkeley on May 3, 1901; he and R. T. Crawford were the first students to receive Ph.D. degrees in mathematics at Berkeley. Ross's thesis was entitled "Differential Equations Belonging to a Ternary Linearoid Group."

After short periods at Mt. Tamalpais Military Academy in California and the University of Nevada he became an assistant in the Nautical Almanac office in Washington in 1902. He was a research assistant in the Carnegie Institution (1903-1905), and served as director of the International Latitude Station at Gaithersburg, Maryland, from 1905 to 1915. He joined the Eastman Kodak Company as a physicist in 1915 and was active in research there on the physics of the photographic process until 1924, when he joined the Yerkes Observatory of the University of Chicago as Associate Professor; he was promoted to Professor in 1928. Ross was elected to the National Academy of Sciences in 1930. He retired from the University of Chicago in 1939, at the age of sixty-five, and moved to Pasadena, California, where he lived until his death on September 21, 1960. He married three times: Margaret J. Benton in 1904; Elizabeth Bischoff in 1913; and Anna Olivia Lee Ross, who survives him. He had three children: two sons, Robert and Alan, and a daughter, Mrs. Barbara Ross Roberts.

DESCRIPTION OF ROSS'S MOST SIGNIFICANT RESEARCH WORK

During his work at Gaithersburg, Ross became interested in the problem of distortions on the emulsion of photographic plates introduced during the drying process. A careful investigation showed that such distortions were well measurable on plates dried in air. But when plates were bathed in alcohol before being allowed to dry, the precision of registration was much greater.

This was the first of a series of investigations by Ross concerned with the photographic effects on the accuracy in registration of the position of star images. Later papers dealt with this problem in terms of distortions on the photographic plate due to inequalities of drying: "... if contiguous areas of a plate are in different phases with respect to drying, [the] stresses

become unbalanced, and the gelatine accordingly moves from the region of slow toward the region of quick drying." The investigations of Ross and others in this field are still not completely appreciated; more serious attention paid to these results might give a major increase in accuracy in astrometric investigations.

The first of a classical series of papers announcing the discovery of new stars of large proper motion was published in 1926. Further studies of these nearby stars which had been discovered by Ross have brought to light a large number of extremely interesting dwarf, and white-dwarf, stars.

A remarkable series of photographs of the planet Mars was obtained by Ross at Mt. Wilson Observatory during the opposition of the planet in 1926. These photographs, which were obtained in five different colors, extended the pioneering work of W. H. Wright of the Lick Observatory in 1924; in the ultraviolet Ross photographed Martian atmospheric details with remarkable clarity.

In 1928 Ross published one of the classical investigations of the surface of the planet Venus. He found that photographs taken with ultraviolet light showed details which he interpreted as cloud formations to be always present; red and infrared photographs showed no detail at all. He concluded that the outer atmosphere of Venus is composed of cirrus clouds, while the inner atmosphere is exceedingly dense and yellowish; the details he photographed in the ultraviolet were interpreted as being atmospheric disturbances. It is remarkable how little our knowledge of Venus has advanced in the thirty years following Ross's paper.

A series of photographs (published 1927-1931) with a new lens of his own design revealed new features associated with some of the best-known nebulosities of the northern sky. This work culminated in 1934 with the publication of the magnifi-

cent *Atlas of the Milky Way* with Mary R. Calvert. This atlas, which consists of original photographic prints, revealed for the first time some of the large-scale characteristics of the northern Milky Way. The photographs were obtained with a five-inch lens designed by Ross.

The most important work of Ross's life was the introduction of correcting lens systems for use with large reflecting telescopes. His correcting lenses for the Mt. Palomar 200-inch reflector increased the size of the usable field greatly, and made possible much of the remarkable work of the late Walter Baade. The importance of the Ross correcting lenses in twentieth-century astronomy is so great that, had he done no other work, he would still have occupied a high place.

He disliked the spectacular life of some of his contemporaries and, next to work, seemed to enjoy more than anything else a quiet game of bridge and an early bedtime. His imprint on astronomy is deep and permanent.

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KEY TO ABBREVIATIONS

Abr. Sci. Publ. Res. Lab. Eastman Kodak Co. = Abridged Scientific Publications from the Research Laboratory of the Eastman Kodak Company
Astron. J. = Astronomical Journal
Astron. Nachr. = Astronomische Nachrichten
Astrophys. J. = Astrophysical Journal
Lick Obs. Bull. = Lick Observatory Bulletin
Pop. Astron. = Popular Astronomy
Publ. Astron. Soc. Pac. = Publications of the Astronomical Society of the Pacific

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